

REMARKS

Claims 20-34 and 36-53 are pending. Claims 1-19 and 35 have been previously cancelled. Claims 20, 37 and 48-51, 53 have been amended to further clarify the claim language. The Applicant points out that the above claim amendments are supported by at least pages 2-3, 8, and Figs. 2-4B of the specification. The Applicant respectfully submits that the claims define patentable subject matter.

Claims 20-34 and 36-53 are rejected under 35 U.S.C. § 112, first paragraph for allegedly failing to comply with the enablement requirement.

Claims 20-34 and 36-53 are rejected under 35 U.S.C. § 101 for allegedly being directed to non-statutory subject matter.

Claims 20, 23-34, 36-37 and 40-53 are rejected under 35 U.S.C. § 103(a) as being unpatentable over "Unitary ESPRIT: How to Obtain Increased Estimation Accuracy with a Reduced Computational Burden" ("Martin") in view of Applicant's admitted prior art in Brief Description of Related Art on page 1 of the present application ("AAPA").

Claims 21-22 and 38-39 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Martin in view of AAPA, as applied to claims 20 and 37, and further in view of USP 5,592,517 ("Camp").

Application № 09/911,764
Reply to Office Action of March 17, 2009

The Applicant respectfully traverses these rejections at least for the reasons previously set forth during prosecution and at least based on the following remarks.

I. Claim Rejections under 35 U.S.C. § 112, First Paragraph

Claims 20-34 and 36-53 are rejected under 35 U.S.C. § 112, first paragraph for allegedly failing to comply with the enablement requirement. Specifically, the Examiner alleges that in claim 20, the newly added “DSP that enables adaptive filtering of adaptation observations for communication and control signals, wherein during said adaptive filtering, the DSP enables...” was not sufficiently described in the specification to enable one skilled in the art to make and/or use the invention. The Examiner also alleges that the term “filter” was merely mentioned in the Background of the invention, but not in detail within the specification.

The Applicant respectfully disagrees, and points out that Applicant in page 3 of the specification, discloses that the computational operation (i.e., adaptive filtering for communication signals) is advantageously performed by applying LESS in a Digital Signal Processor. Nevertheless, to further prosecution, the Applicant has amended independent claims 20 and 37 to further clarify the claim language.

With regard to the Examiner’s allegation that the term “filter” was merely mentioned in the Background of the invention, but not in detail within the specification, the Applicant respectfully disagrees, and points out that the term

Application № 09/911,764
Reply to Office Action of March 17, 2009

"adaptive filtering" is also mentioned in the "Summary Of The Invention", as well as in the title of the Application and in the claims. Moreover, the Examiner is referred to Applicant's 1/9/09 RCE response, where it is clarified that an "adaptive filter" to communication signal is implemented by a programmable Digital Signal Processor (DSP), which is disclosed in Figs. 2-6 of the present application.

Based on the foregoing rationale, the Applicant maintains that the amendments to claims 20 and 37 are supported by Applicant's Specification. Claims 21-34, 36, and 38-53 depend directly or indirectly from independent claims 20 and 37 respectively. The Applicant respectfully requests that the rejection to claims 20-34 and 36-53 under 35 U.S.C. § 112, first paragraph be withdrawn.

II. Claim Rejections under 35 U.S.C. § 101

Claims 20-34 and 36-53 are rejected under 35 U.S.C. § 101 for allegedly being directed to non-statutory subject matter. Specifically, the Examiner alleges that claims 20-34 and 36-53 merely disclose series mental steps/components for filtering including transformation and computation but without disclosing a physical application. In addition, the Examiner argues that claims 37-53 disclose the one or more processors, which can be software modules.

The Applicant respectfully disagrees. Nevertheless, the Applicant points out that the present amendments to claims 20 and 37 should further overcome the alleged rejection under 35 U.S.C. § 101. More specifically, the Applicant's claim

Application № 09/911,764
Reply to Office Action of March 17, 2009

20 now recites "**a DSP** (Digital Signal Processor) that applies Least Square Solvers (LESS) to adaptive filtering of adaptation observations for communication and control signals, wherein during said adaptive filtering, **said DSP performs...**" In this regard, the transformation steps carried out in the adaptive filtering process are performed by a DSP, which is statutory subject matter.

Likewise, Applicant's claim 37 has been amended to recite "at least one DSP", which is supported by page 3 of the Specification, in place of the "one or more processors". The Applicant submits that this amendment overcomes the argument that the "one or more processors" are software modules.

Therefore, based on the amendments and the above arguments, the Applicant respectfully requests that the rejection to claims 20-34 and 36-53 under 35 U.S.C. § 101 be withdrawn.

III. RESPONSE TO EXAMINER'S ARGUMENTS

In page 13 of the Office Action, the Examiner alleges that Applicant's amendments in claim 20 do not provide sufficient support for how the DSP can enable "adaptive filtering of adaptive observations for communication and control signals".

The Examiner is referred to the arguments in subsection I above. Applicant's claim 20 has been amended to recite "**a DSP** (Digital Signal Processor) that **applies Least Square Solvers (LESS) to adaptive filtering of adaptation**

Application № 09/911,764
Reply to Office Action of March 17, 2009

observations for communication and control signals, wherein during said adaptive filtering, said DSP performs..." In other words, the adaptive filtering of adaptation observations (or measurements) for communication and control signals is enabled and performed through applying LESS in a DSP, which is disclosed in page 3 of the Specification. Therefore, based on the foregoing rationale, the Applicant maintains that the amendments in claim 20 contain no new matters.

Likewise, the Applicant has also amended claim 37 to recite "at least one DSP", which is supported in page 2 of Specification, in place of "one or more processors". The Applicant submits that the claims 20-34 and 36-53 are in condition for allowance, and respectfully requests that the rejection to claims 20-34 and 36-53 under 35 U.S.C. § 101 and 35 U.S.C. § 112, first paragraph be withdrawn.

In page 14 of the Office Action, the Examiner argues that AAPA in page 1 discloses adaptive filtering by DSP. The Applicant respectively disagrees, and points out that AAPA in page 1 merely discloses "Adaptive Signal Processing", which signal processing can be performed by a software module, a position taken by the Examiner in the Office Action. Since AAPA in page 1 does not specifically disclose using a DSP (Digital Signal Processor), which is a hardware device, the Applicant maintains that AAPA could use software modules instead of DSP to perform the adaptive signal processing. Martin does not overcome AAPA's deficiencies. In this regard, the Applicant maintains that the combination of Martin and AAPA at least does not disclose or suggest "a DSP (Digital Signal Processor)

Application № 09/911,764
Reply to Office Action of March 17, 2009

that applies Least Square Solvers (LESS) to adaptive filtering of adaptation observations for communication and control signals," as recited in Applicant's claim 20.

Furthermore, the Examiner relies for support on Martin in page 1232, which discloses "a Unitary ESPRIT effectively doubles the number of data samples... of real-valued matrices of the same size..." The Examiner argues that Martin therefore reads on Applicant's "**transforming** said adaptation observations from a complex arithmetic **to two corresponding sets of real number arithmetic observations** by means of binary orthogonalization transformation (BOT)..." The Applicant respectfully disagrees, and points out that Martin merely discloses "doubles the number of data samples", which **effectively enlarges the real number matrix to twice its size, and not generating two real number matrices**, as alleged by the Examiner.

More specifically, the Examiner is referred to Martin which simply discloses that the matrix is doubled in size, without generating separate matrices. For example, at the bottom of page 1233, Martin discloses transforming an arbitrary complex matrix C^{pxq} into a matrix C^{px2q} , which is **enlarged in size** to twice the original size of pxq , **without doubling in the quantity of matrices**, as alleged by the Examiner. In this regard, the Applicant's argument that AAPA and Martin does not disclose or suggest "**transforming** said adaptation observations from a complex arithmetic **to two corresponding sets of real number arithmetic**

Application № 09/911,764
Reply to Office Action of March 17, 2009

observations by means of binary orthogonalization transformation (BOT)..." is still maintained.

Based on the foregoing arguments, the Applicant maintains that the combination of Martin and AAPA does not establish a *prima facie* case of obviousness to reject Applicant's claim 20.

IV. REJECTION UNDER 35 U.S.C. § 103

In order for a *prima facie* case of obviousness to be established, the Manual of Patent Examining Procedure, Rev. 6, Sep. 2007 ("MPEP") states the following:

The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1396 (2007) noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness."

See the MPEP at § 2142, citing *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006), and *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d at 1396 (quoting Federal Circuit statement with approval). Further, MPEP § 2143.01 states that "the mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art" (citing *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1396 (2007)). Additionally, if a

Application № 09/911,764
Reply to Office Action of March 17, 2009

prima facie case of obviousness is not established, the Applicant is under no obligation to submit evidence of nonobviousness:

The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

See MPEP at § 2142.

A. The Proposed Combination of Martin and AAPA Does Not Render Claims 20, 23-34, 36-37 and 40-53 Unpatentable

The Applicant now turns to the rejection of claims 20, 23-34, 36-37 and 40-53 under 35 U.S.C. 103(a) as being unpatentable over Martin in view of AAPA (Fig. 1 of the present application).

A(1). Rejection of Independent Claims 20 and 37 under 35 U.S.C. § 103 (a)

With regard to the rejection of independent claim 20 under 35 U.S.C. § 103(a), the Applicant submits that the combination of Martin and the AAPA does not disclose or suggest at least the limitation of "a **DSP** (Digital Signal Processor) **that applies Least Square Solvers (LESS)** for reduction of computational complexity **to adaptive filtering** of adaptation observations for communication and control signals," as recited in claim 20 by the Applicant.

The Applicant refers the Examiner to the arguments in section III above. More specifically, the Examiner takes the position a processor that processes

Application № 09/911,764
Reply to Office Action of March 17, 2009

signals could be performed by a software module (see Office Action at page 3). In this regard, since AAPA merely discloses "adaptive signal processing", therefore AAPA could be a software module, which is not a **DSP** hardware, for adaptive signal processing. Martin does not overcome AAPA's deficiencies. In this regard, the Applicant maintains that the combination of Martin and AAPA at least does not disclose or suggest "**a DSP (Digital Signal Processor) that applies Least Square Solvers (LESS) to adaptive filtering** of adaptation observations for communication and control signals," as recited in Applicant's claim 20.

In addition, regarding the rejection of claim 20, the Applicant submits that the combination of Martin and the AAPA does not disclose or suggest at least the limitation of "**transforming** said adaptation observations **from a complex arithmetic to two corresponding sets of real number arithmetic observations**," as recited in claim 20 by the Applicant.

In the Final Office Action, the Examiner alleges Martin discloses the following:

"means for transforming adaptation observations from a complex arithmetic to two sets of real number arithmetic observations by means of binary orthogonalization transformation (BOT) (e.g. page 1232 right column lines 3-17 which transforming/converting the complex matrices into a set of real matrices)"

See the Final Office Action at page 4 (with emphasis). Specifically, The Examiner relies for support on Martin, page 1232, which states:

Unitary ESPRIT effectively **doubles the number of data samples**, the computational complexity is reduced by **transforming the required rank-revealing factorizations of complex matrices into decompositions of real-valued matrices of the same size...**"

See Martin at page 1232, right column, lines 3-7 (with emphasis). The Examiner, in page 14 of the Office Action, relies for support on Martin in page 1232, which discloses "a Unitary ESPRIT effectively doubles the number of data samples... of real-valued matrices of the same size..." The Examiner argues that Martin, therefore, reads on Applicant's "**transforming** said adaptation observations from a complex arithmetic **to two corresponding sets of real number arithmetic observations** by means of binary orthogonalization transformation (BOT)..."

The Applicant respectfully disagrees, and points out that the Examiner has misconstrued Martin. Namely, Martin discloses that the matrix is doubled in size, but there is no change in the number of the matrices. The Examiner is referred to the arguments in section III above, that Martin (see the bottom of page 1233) discloses transforming an arbitrary complex matrix $C^{p \times q}$ into a matrix $C^{p \times 2q}$, which is enlarged in size to twice the original size of $p \times q$, and without doubling in the number of matrices, as alleged by the Examiner. In this regard, the Applicant's argument that AAPA and Martin does not disclose or suggest "**transforming** said adaptation observations from a complex arithmetic **to two corresponding sets of**

Application № 09/911,764
Reply to Office Action of March 17, 2009

real number arithmetic observations by means of binary orthogonalization transformation (BOT)...” is still maintained.

In addition, the Applicant maintains the remaining arguments of the 1/9/09 RCE response, that the combination of Martin and AAPA does not disclose or suggest at least the limitation of “computing **two corresponding** sets of real number arithmetic adaptation parameters by **applying two respective** real number Least Square Solvers (**LESS**) to said **two corresponding sets of real number arithmetic observations**,” as recited by the Applicant in independent claim 20.

In the Office Action, the Examiner concedes the following:

“Martin et al. fail to explicitly spell-out the term LESS as a means for computing two sets of real number arithmetic adaptation parameters by applying two real number Least Square Solvers (LESS) to said two sets of real number arithmetic observations.”

See the Office Action at page 5. The Examiner relies for support on the Applicant’s discussion of prior art (AAPA) in page 1 of the pending application and states the following:

“However, the admitted prior art discloses in page 1 a means for computing **two sets of real number** arithmetic adaptation parameters **by applying two real number Least Square Solvers (LESS) to said two sets of real number arithmetic observations** (e.g. last two paragraphs in page 1 wherein LESS is common and most widely used in solving such systems of linear equations).”

Application № 09/911,764
Reply to Office Action of March 17, 2009

See the Office Action at page 5 (with emphasis). The Applicant further argues the fact that AAPA discloses solving only complex valued elements instead of solving real-valued elements. In response, the Examiner at page 14 of the Office Action, argues that the “LESS concept seen in the AAPA is combined into the real matrices transformed by Martin in order to efficiently solving unknowns in linear system equations due to optimization of the LESS”. In other words, the Examiner disregards the fact that AAPA does not disclose that LESS is applied to real-valued elements, but to complex number parameters instead.

The Applicant respectfully disagrees. Nevertheless, even assuming for the sake of argument that the AAPA LESS discloses solving real-valued elements (which it does not), the combination of Martin and AAPA would disclose only half as many LESS for the required real-valued matrices. In other words, Martin discloses only a one-to-one (instead of a one-to-two) transformation of a complex centro-Hermitian matrix M into to **an enlarged** single real-valued matrix C^{px2q} of the same size (using SVD). Consequently, **Martin requires only half as many LESS** for the obtained real-valued matrix C^{px2q} of the same size after transformation.

Therefore, based on the foregoing rationale, the Applicant maintains that the combination of Martin and AAPA does not disclose or suggest at least the limitation of “computing **two corresponding** sets of real number arithmetic adaptation parameters by **applying two respective** real number Least Square

Application № 09/911,764
Reply to Office Action of March 17, 2009

Solvers (LESS) to said two corresponding sets of real number arithmetic observations," as recited by the Applicant in independent claim 20.

Moreover, with regard to the rejection of independent claim 20 under 35 U.S.C. § 103(a), the Applicant submits that the combination of Martin and AAPA does not disclose or suggest at least "**transforming**, after said computing with said two respective LESS, **each of said two corresponding sets** of real adaptation parameters **to a single set** of complex number arithmetic adaptation parameters **using an inverse binary orthogonalization transform (IBOT)**," as recited by the Applicant in independent claim 20.

In the Office Action, the Examiner alleges that Martin discloses the following:

"transforming said two sets of real adaptation parameters to a set of complex number arithmetic adaptation parameters using an inverse binary orthogonalization transform (IBOT) (e.g. **as reversed processed of BOT** above, page 1232 right column lines of first paragraph, and right column lines 8-10 page 1232),"

See the Office Action at pages 4 (with emphasis). The Examiner relies for support on Martin, specifically, Martin states:

"...This reduction can be achieved by constructing **invertible transformations** that map **centro-Hermitian matrices to real matrices**"

See Martin at page 1232, right column lines 8-10. The Examiner, at page 14 of the Office Action, argues that the term "invertible" means capable of

Application № 09/911,764
Reply to Office Action of March 17, 2009

backward or forward transformation. In other words, the Examiner alleges that the transformation process from a complex matrix M to a single real-valued matrix $C^{p \times 2^q}$ of the same size can be reversed back to a complex value matrix M.

Nevertheless, even assuming that Martin's transformation is invertible, the Applicant points out that the Examiner's argument is still deficient. Martin discloses a one-to-one correspondence (instead of one-to-two), i.e., a single complex matrix M is transformed to yield a single real-valued matrix $C^{p \times 2^q}$ by SVD. In this regard, Martin's invertible transformation (i.e., $C^{p \times 2^q}$ to M) is still a one-to-one correspondence (instead of a two-to-one correspondence).

In this regard, Martin still does not disclose "**transforming**, after said computing with said two respective LESS, **each of said two corresponding sets** of real adaptation parameters **to a single set** of complex number arithmetic adaptation parameters **using an inverse binary orthogonalization transform** (IBOT)," as recited by the Applicant in independent claim 20. Likewise, AAPA does not overcome the above deficiency of Martin.

Furthermore, the Applicant has initially pointed out in the above argument that Martin discloses the "ESPRIT" is a signal estimation technique used on the phase array antenna sensors, Martin therefore does not disclose or suggest "utilizing at least a portion of **said single set of complex number arithmetic adaptation parameters for said DSP adaptive filtering** of said adaptation

Application № 09/911,764
Reply to Office Action of March 17, 2009

observations," as recited by the Applicant in claim 20. Likewise, AAPA does not overcome the above deficiency of Martin.

Accordingly, based on the foregoing rationale, the Applicant maintains that the combination of Martin and AAPA does not establish a *prima facie* case of obviousness to reject claim 20. The Applicant respectfully requests that the rejection to claim 20 under 35 U.S.C. § 103(a) be withdrawn, and independent claim 20 should be allowable.

Likewise, independent claim 37 is similar in many respects to independent claim 20, and is also submitted to be allowable. The Applicant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 20 and 37.

A(2). Rejection of Dependent Claims 23-34, 36 and 40-53

Based on at least the foregoing, the Applicant believes the rejection of independent claims 20 and 37 under 35 U.S.C. § 103(a) as being unpatentable over Martin in view of AAPA has been overcome and requests that the rejection be withdrawn. Additionally, claims 23-34, 36 and 40-53 depend directly or indirectly from respective independent claims 20 and 37, and are, consequently, also respectfully submitted to be allowable.

Application № 09/911,764
Reply to Office Action of March 17, 2009

In addition, with regard to the rejection of claims 31 and 48, the Examiner is referred to the similar argument in claim 20, that the combination of Martin and the AAPA does not disclose applying two real numbers to LESS (likewise to also CLESS). Therefore claims 31 and 48 are submitted to be allowable.

Additionally, claims 23-34, 36 and 40-53 depend directly or indirectly from respective independent claims 20 and 37, and are, consequently, also respectfully submitted to be allowable.

B. The Proposed Combination of Martin, AAPA and Camp Does Not Render Claims 21-22 and 38- 39 Unpatentable

With regard to the rejection of claims 21-22 and 38-39, the Examiner has cited the AAPA in Fig. 1, where the LESS block 100 is applied in series, alleging that the LESS block 100 also discloses the Applicant's claimed "two real number LESS are applied in series". The Applicant points out that the LESS block 100 discloses a single input of complex-valued vector input in series, not "two real number applied in series". The Examiner relies for support on Camp to disclose the AAPA's deficiencies. However, Camp still does not disclose the deficiencies of Martin and AAPA in independent claims 20 and 37.

Additionally, claims 21-22 and 38- 39 depend directly or indirectly from respective independent claims 20 and 37, and are, consequently, also respectfully submitted to be allowable. Furthermore, the Applicant also reserves the right to

Application № 09/911,764

Reply to Office Action of March 17, 2009

argue additional reasons beyond those set forth above to support the allowability
of claims 21-22 and 38- 39.

Application № 09/911,764
Reply to Office Action of March 17, 2009

CONCLUSION

Based on at least the foregoing, the Applicant believes that all claims 20-34 and 36-53 are in condition for allowance. If the Examiner disagrees, the Applicant respectfully requests a telephone interview, and request that the Examiner telephone the undersigned Patent Agent at (312) 775-8093.

The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to the deposit account of McAndrews, Held & Malloy, Ltd., Account No. 13-0017.

A Notice of Allowability is courteously solicited.

Respectfully submitted,

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